



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Furunaga, et al.
Serial No.: No. 09/982,770
Filed: October 22, 2001
For: SIZING AGENT AND RECORDING PAPER
COMPRISING SIZING AGENT
Art Unit: 1711
Examiner: UMAKANT K. RAJGURU

DECLARATION UNDER 37 CFR § 1.132

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

I, Yoshiyuki Kondo, a citizen of Japan, declare that:

- (1) I am one of the inventors listed in the above-identified application.
- (2) I reside at 526-3 Kuiseke4, Koushoku-shi, Nagano-ken, Japan.
- (3) I graduated from Chiba University, Faculty of Education in 1962, specializing in Science, and also studied in Graduate School of Engineering, Nihon University, from April 1962 to March 1964, specializing in Applied Chemistry, being granted a degree of the Doctor of Engineering by Nihon University in December 1970.
- (4) I joined Shinshu University in 1964, as a research assistant in Faculty of Textile Science and Technology, and was an assistant professor from January, 1975 (Highpolymer Properties) to September 1986 (Bio Science and Textile Technology in Graduate School of Science and Technology, specializing in Biopolymer since June 1982), studying in Brain Laboratory of the Medical Department, Rochester University, New York in the U.S.A., from September 1981 to June 1982, as a research fellow abroad of the Ministry of Education, Japan.

(5) I was Professor of Biopolymer, Faculty of Textile Science and Technology, Shinshu University, since October 1986, and held an additional post of Professor of Biopolymer Engineering in the Department of Biological Function Engineering, Graduate School of Science and Technology, Shinshu University, since April 1991.

(6) I am now Professor of Organ Highpolymer Engineering in the course of Medical Science, specializing in Organ Transplants and Cellular Engineering, Graduate School of Medicine, Shinshu University since April 2000.

(7) I am familiar with the present invention and the prosecution history of the above-identified application.

(8) I have reviewed the Office Action mailed July 9, 2004 and the reference cited by the Examiner.

(9) To demonstrate difference between the sizing agent comprising a water-soluble soybean polysaccharide of the present invention and an aqueous coating agent made of Example 2 in Table of Auhorn et al. (US Patent 4,908,204) (Auhorn) in fixing and color development of ink on a paper surface and to show an advantageous feature of the present invention over Auhorn, I have conducted the following experiments.

Experiments

1. Starting Materials

Starting materials in RUN Nos. 1 and 2 having a composition shown in Table 1 below were used.

RUN No. 1:

Water-soluble soybean polysaccharide; Tradename "Soyafive S-DN," available from Fuji Oil Co., Ltd.

RUN No. 2:

Example 2 (Comparative Example) of Auhorn; Digested cationic starch was not used in the Experiments based on the Examiner's opinion in the report dated July 1, 2004 about an intensive interviews with the Examiner, and, accordingly, Cationic dispersion 2 (component (b)) was used in an amount of 40 parts by adding an extra weight of an amount of 6.7 parts by weight of Digested cationic starch to be used.

Table 1
Composition of Sizing Agent (parts by weight on a solid basis)

RUN No.	1(7) ^(*)	2 ^(*)
China Clay ⁽¹⁾	--	100
Na Salt of Polyacrylic Acid ⁽²⁾	--	0.5
Water-Soluble Soybean Polysaccharide ⁽³⁾	1.2	--
Cationic Polymer ⁽⁴⁾	1.2	--
Digested Cationic Starch	--	--
Cationic Dispersion 2 ⁽⁵⁾	--	33.3 + 6.7
Alumina ⁽⁶⁾	0.6	--
Surfactant ⁽⁷⁾	0.3	--
Total of Solid Components	3.3	140.5
Solid Component Used in an Aqueous Solution	3.3	2.0
Water	96.7	98.0

Note:

(*1) EXAMPLE, which corresponds to EXAMPLE No. 7 in Table 1 of the specification.

(*2) COMPARATIVE EXAMPLE disclosed in the cited reference US Patent 4,908,204 to Auhorn et al., Example 2 in Table 2.

(1) Tradename "AA Kaolin," available from Fuji Talc Ind., Ltd.

(2) Tradename "ARON T-40; Available from Toagosei Co. Ltd.

(3) Tradename "Soyafive S-DN," available from Fuji Oil Co., Ltd.

(4) Viscous cationic polymer obtained by polymerizing a mixture of 70 parts by weight of N,N-dimethylaminoethyl acrylate + methyl chloride and 30 parts by weight of dimethyl acrylamide in a 15% concentration.

(5) Prepared by the procedure described at column 10, lines 30-49 of US'240.

- (6) Easily sinterable, low-sodium alumina (Tradename "AES-12," available from Sumitomo Chemical Co., Ltd.).
- (7) Nonyl phenol ("Brownon N-509," HLB of 12.8 available from Aoki Oil Industrial Co., Ltd.).

2. Preparation of sizing Agents

RUN No. 1:

This composition was the same composition with that described in EXAMPLE No. 7 in Table 1 of the specification of the present application.

RUN No. 2:

Although an aqueous coating agent made of Example 2 of Auhorn containing a solids content of about 25% by weight was prepared to coat it on the raw paper (see column 12, lines 22-28 of US'240), the aqueous coating agent thus obtained was too viscous to coat it on the raw paper by the coater of our own making. Accordingly, the aqueous coating agent containing the solid components of 2.0 parts by weight was used as shown in RUN No. 2 of Table 1 above.

3. Preparation of test samples.

A raw paper having a basis weight of 70 g/m² was coated with a sizing agent or an aqueous coating agent having a composition shown in RUN No. 1 and RUN No.2 of Table 1 by such a coater that was similar to a sizing press system coater (corresponding to one step of paper manufacture) in an amount of 5 g/m² on a solid basis, and dried at 120°C for 5 minutes in an oven.

Each recording paper thus obtained in RUN No. 1 and RUN No. 2 was used for full-color printing with an inkjet printer (color bubble-jet printer "S600," available from Canon Inc.).

4. Measurements

Printed samples were evaluated with respect to color development, water resistance.

- (1) Color Development: Spectrophotometer ("NF-333" available from Nippon Denshoku Industries Co., Ltd.).
- (2) Water Resistance: Evaluated by measuring by the naked eye the blur of

image on a sample that was fixed at an angle of 45° immediately after printing, on which 750 µl of water was dropped.

The evaluation standards of the water resistance were as follows:

- ◎: Completely no blur.
- : Slight elution of ink into water, with no blur of ink on the paper.
- △: Slight blur of ink on both surfaces of the paper.
- X: Extreme blur of ink on both surfaces of the paper.

In addition to the color development and water resistance above, the feathering, bleeding test and ink fixation were evaluated as follows.

- (3) Feathering: Measured by the naked eye the blur of image of the portion of the fine lines of each printed chart.
- (4) Bleeding test: Evaluated by measuring by the naked eye the blur of image between Red and Black, and Yellow and Black, respectively.
- (5) Ink fixation: Evaluated by slipping the fully black printed portion with a loading of 40 g/m².

5. Results and Discussion

The results are shown in Table 2 below and printed-papers (A) *¹⁾ and (B) *²⁾ attached hereto.

Table 2 Results of Evaluation

No.	Color Development of Ink				Water Resistance
	Red	Yellow	Blue	Black	
EXAMPLE (A) * ¹⁾ (RUN No. 1)	1.139	0.913	1.146	1.322	◎
COM. EX. (B) * ²⁾ (RUN No. 2)	1.117	0.856	1.104	1.460	X

Note: *¹⁾ See Sheet NCA-107-1 (A).

*²⁾ See Sheet ex 2-1 (B).

As is clear from Table 2 above, in EXAMPLE (A) using the sizing agent of the present invention, excellent color development was achieved in red, yellow and blue colors of dyes except for black color of a pigment. In this

regard, it is noted that the difference of the measured values between EXAMPLE (A) and COMPARATIVE EXAMPLE (B) in hundredth is within measurement errors.

Also, in EXAMPLE (A) coated by the sizing agent of the present invention, the water resistance was improved greatly from that in COMPARATIVE EXAMPLE (B) coated by the aqueous coating agent of Auhorn. The significantly advantageous feature of the sizing agent using the water-soluble soybean polysaccharide of the present invention over that of the aqueous coating agent of Auhorn in the water resistance can be found by comparing the backside surfaces of both printed-papers (A) and (B). In the backside surface of the printed-paper (A), no blur of ink is observed.

These advantageous features of the present invention over Auhorn mentioned above can be ascribed to the multiplication effect of a water-soluble soybean polysaccharide, a cationic polymer and a surfactant in the sizing agent of the present invention, as explained in the specification, page 3, line 12 to page 4, line 12 with Fig. 1 and Figs. 2 (a) to 2 (c) of the present application.

With respect to the feathering, bleeding test and ink fixation, the printed-paper (A) seems be not always superior at glance to the printed-paper (B) in all of these three aspects. One reason of these phenomena is presumably due to the raw paper having no uniformly planed surface, which has been prepared in a laboratory scale without using necessary additives and machines to be used for mass production.

6. Conclusion

The sizing agent of the present invention is unexpectedly superior to an aqueous coating solution made of Example 2 of Auhorn in ink concentration, color development and, particularly, water resistance upon recording paper use.

Therefore, those skilled in the art referring to Auhorn, which fails to teach or suggest any role of the water-soluble soybean polysaccharide in the sizing agent of the present invention, would not be motivated to reach the invention recited in the amended claim 17, and accordingly, the amended claim 17 of the present application is not obvious over Auhorn.

10) I declare further that all statements made herein on personal knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated September 29 , 2004

Yoshiyuki KONDO

Yoshiyuki KONDO